OCCASIONAL PAPER

The domestic market for small-scale chainsaw milling in Gabon

Present situation, opportunities and challenges

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Brainforest
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Abbreviations

FLEGT	Forest Law Enforcement, Governance and Trade
FOB	Free on board
FSC	Forest Stewardship Council
GDP	Gross domestic product
IRET	Institut de recherche *écologique et tropicale, Gabon*
PGG	*Permis de Gré à Gré,* a permit for low-volume timber logging
PR	Processing rate
RWE	Roundwood equivalent
SME	Small and medium-sized enterprises
SMI	Small and medium-sized industries
VPA	Voluntary Partnership Agreement

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The early results were presented at a national workshop held in Libreville, Gabon, in March 2010, for about 40 representatives from the ministries, civil society and the scientific research community. After incorporating many of the remarks from the workshop, a preliminary version of this report was sent to the workshop participants. Several participants, including Eric Forni and Prosper Obame Ondo, sent written comments that have been incorporated into this document.

This project was funded by the Dutch Directorate General of Development Cooperation (DGIS) through a project titled 'Illegal logging in Cameroon and Gabon: The international FLEGT process, national trends and local impact' and the European Union, with technical support from IFAD and a project titled 'PRO-Formal: Policy and regulatory options to recognise and better integrate the domestic timber sector in tropical countries in the formal economy'. The views expressed in this document do not, in any way, reflect the official position of IFAD, the European Union, DGIS or CIFOR.

Foreword

Since early 2008, the Center for International Forestry Research (CIFOR) has been studying the domestic timber sector in Cameroon, Gabon (Libreville), Republic of Congo (Brazzaville, Pointe-Noire), Democratic Republic of Congo (Kinshasa) and Central African Republic (Bangui), together with partners based in these countries. Funding to conduct research at the subregional level was granted mainly by the Netherlands International Cooperation Agency, the European Union and the French Development Agency.

We decided to conduct parallel research on the domestic timber sector in several countries in the Congo Basin for several reasons. First, very little information is available on this sector, which is still largely informal, despite growing demand for its products in urban areas. In all the study countries, this sector accounts for a sizeable share of the timber production, sometimes even more than the official sector. Second, all 5 countries either have signed or are negotiating a Voluntary Partnership Agreement (VPA) under the Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan of the European Union. This should result, in the short to medium term, in all countries adopting a traceability system which will guarantee the legality of all products from forestry operations, whether sold on the national or international market. Last, these countries have similar forestry codes and policies, and the local populations use the lands and forest resources in a similar manner, thus giving relevance to comparisons of how chainsaw milling operates at the sub-regional level.

What is meant by 'domestic timber sector'? This sector is often understood as the opposite of the industrial sector that fells trees and processes the timber for export. Although in some cases the boundary between informal and industrial production becomes blurred—some industrial scrap is sold on the national market and some timber produced by chainsaw millers is sold on the international market—the two sectors have distinct characteristics (Table 1).

Table 1. Distinguishing characteristics between domestic and industrial sectors

Characteristic	Domestic	Industrial
Felling permit	No (or very rarely)	Yes (concessions, council and community forests, timber recovery, etc.)
Felling and processing techniques	Chainsaw (sometimes mobile saw) for felling and processing in the forest; small number of trees per operation	Heavy machinery, often in the annual allocated areas (*assiettes annuelles de coupe*); large number of trees per operation; processing plant
Sales	Lower-quality sawnwood for national market and neighbouring countries	Logs, sawnwood, veneer, plywood, wooden floors, almost exclusively for export
Taxes and regulations	Largely informal	Largely formal

The whole domestic timber sector is marked by informal practices, from felling trees to selling sawnwood. Although informal methods do not quite respect all the national regulations, they do not necessarily break the law either. That is why we prefer the word 'informal' to 'illegal'. The activities of most of the chainsaw millers could be covered by a legal felling permit but, for various reasons that we will try to explain, the chainsaw millers do not ask for such permits and prefer to keep operating in the informal economy. The main purpose of this report, therefore, is to explain how the domestic timber sector functions in an effort to contribute to finding ways to make it legal and secure.

In response to this situation, CIFOR is publishing (2011) 5 reports describing the domestic timber sector in each of the 5 countries in the survey, plus a final report to compare the functioning and challenges of the domestic sawmill sector throughout the subregion. We hope that this research will contribute to improving forest policies at national and subregional levels by giving this activity, undervalued and all too often criminalised, the position it deserves.

1 Introduction

With sparsely populated forestland covering most of the country, Gabon has the highest forest:population ratio in Africa. Forest resources, therefore, are a pillar of the country's long-term national development. Timber exploitation and trade account for 42% of non-oil exports and employ about 14 000 people (Chevalier *et al.* 2009). As in other countries in the subregion, nearly all timber produced in the official sector is exported. One species, okoumé (*Aucoumea klaineana*), comprises more than 80% of Gabon's exports, and most exports are logs (1.5–2 million m^3 per year until 2009). For the past 10 years, most of the okoumé logs have been exported to Asia, in particular China; the main 'other wood' products are exported to Europe, but in much smaller volumes.

The aim of Gabon's forest policy is to boost the contribution of the forestry sector to 10% of gross domestic product by 2012 whilst developing an effective model for sustainable forestry management. Supporting this strategy is, for example, the Forestry Code enacted in 2001 through Law No. 16/01, which revises the basic tenets of forest management. This regulation has been complemented since 2008 by increasing private efforts to certify forest concessions. To date, an area of 1.8 million ha has been certified under the Forest Stewardship Council (FSC) standard. Further, to guarantee access to European markets and improve the traceability system for timber production, Gabon has entered into negotiations with the European Union that should lead, in the next few years, to the conclusion of a Voluntary Partnership Agreement (VPA) as part of the Forest Law Enforcement, Governance and Trade (FLEGT) process. Last, a presidential decision taken in November 2009 obliges logging companies to process 100% of their wood, effective from 2010. This decision accelerates and strengthens the implementation of Article 227 of the Forestry Code, which required logging companies to process 75% of their local timber production as of 2012.

These provisions generally aim at improving the management of the large forest concessions that produce timber for the export market and generate substantial revenue for the state. Recently, the government has made effort to involve the smaller national operators in the system, but it is too early to assess the results. Gabon's forest policy, like those of other countries in Central Africa, generally ignores the many small, often informal enterprises that produce most of the timber required to meet national demand. Although the government is aware of the need for better understanding and greater appreciation of these small and micro-enterprises' contribution at the national level (Mabiala 2004), there is still no complete picture of the sector. This report, which is based on surveys conducted over 2 years, seeks to contribute to better understanding and evaluation of the small-scale chainsaw milling sector in Libreville and, more broadly, in Estuaire Province. We believe this zone provides the best possible sample for understanding how this sector functions at the national level, for the following reasons. First, 80% of Gabon's population live in urban areas, and Libreville is the most populated city. Second, investigations by

Boevinger (2008) in Makokou and by our team in Port Gentil indicate that chainsaw milling in these cities is much less dynamic than in Libreville. At the national level, therefore, Estuaire Province has the highest volume of sawnwood, the most jobs and the most sales from small-scale chainsaw milling.

This report begins by briefly describing the legal and institutional environment for small-scale chainsaw milling for Gabon's domestic market. The second section presents the survey methods used. Following are the results in relation to both the volumes of sawnwood bought in Libreville and the sector's upstream activities in rural areas. The final section contains the discussion and conclusions.

2 Small-scale chainsaw milling in Gabon: Background

Despite having insufficient data on domestic timber consumption in Gabon, Gérard (2007) and Chevalier *et al.* (2009) hypothesized that a large informal timber exploitation and processing sector exists, and that this sector exploits forests located outside the permit zone and supplies almost all of the capital city's demand for sawnwood at very competitive prices.

Little is known about the size of this market. However, during the past few years, Ministry of Forestry has conducted systematic surveys of the sales points for chainsaw products and of second- and third-level processing (carpentry, cabinet making, tapestry work) by small and medium enterprises for the national market. According to information in these reports, which is similar to that collected previously by government services, about 200 sawnwood outlets operate in Estuaire Province. These outlets partner with hardware dealers or specialise exclusively in selling sawnwood. Three-quarters of these are in the Libreville local council area. These outlets provide nearly 400 permanent jobs across the province (Diwassa 2007). Nearly one-fifth of these outlets sell products supplied from sawmill scrap only, half combine scrap and sawnwood from the informal sector and one-third are supplied by the informal sector alone (Mabiala 2004). These outlets are a source of supply for small second- and third-level wood-processing enterprises, but have to compete with direct sales from companies selling their scrap and with micro-entrepreneurs selling sawnwood, often from the informal sector. There are 213 small-scale processing enterprises operating in the Libreville, Owendo and Ntoum council areas (Mabiala 2004), out of 305 across all of Estuaire Province (Diwassa 2007); these enterprises provide more than 700 direct jobs.

The Ministry of Forestry has relatively comprehensive information on the downstream small-scale chainsaw milling sector, although there is no system for monitoring volumes, sales figures or product origins. The small and very small enterprises that make up the sector have the following characteristics:

- labour is provided mainly by the entrepreneur;
- technology is simple with little mechanisation;
- capital is minimal; and
- managerial and technical skills are limited. (Mabiala 2004).

Most small-scale entrepreneurs continue to operate in the informal sector because they are unable to comply with Gabon's strict regulations and fiscal constraints.

Similarly, the upstream small-scale chainsaw milling sector in Gabon is organised around a large number of individual entrepreneurs with limited means and with a general tendency to circumvent the regulations. However, the legal framework, throughout several changes over time, has long been sympathetic to the sector, as shown by the following laws and regulations.

Law No. 1/82 of 22 July 1982 allowed small-scale operations to include the **Coupe Familiale** (Family Felling Permits), applicable for a 5 km radius around the market garden cropping zone. Decree No. 559 of 12 July 1994 specified that this permit applied to no more than 100 trees and was reserved for Gabonese citizens. Logs obtained under this permit could be processed by holders of an *Autorisation de Sciage de Long* (Chainsaw Logging Authorisation), issued under Order No. 228 of 19 January 1993. The Coupe Familiale does not appear as such in the 2001 Forestry Code, although the code allows a 4-year transitional period for felling quotas covered by that permit (Art. 292). The Coupe Familiale was permanently suspended in 2005 (Decree No. 666) and replaced, in theory, by the Forêts Communautaires (Community Forests Permit) and the Permis de Gré à Gré (PGG).

Law No. 1/82 of 22 July 1982 authorised small-scale operations through a **Permis Spécial** (Special Permit) established by Decree No. 180/PR/MEF of 4 March 1969. Until recently, this permit was issued by the forest services, although it did not appear in the Forestry Code. The permit has the following characteristics:

- it grants felling rights for 3 trees with an estimated volume of 8 m^3 sawnwood;
- it is valid for 1–3 months and is renewable;
- it is issued on an individual basis by the provincial delegation after the exploitation zone has been identified and the canton chief *(chef de cantonnement)* has hammer-marked the harvestable trees;
- products made under the permit may be used only in the province of origin; and
- a 6000 F CFA tax is levied for each tree.

The Estuaire Provincial Delegation, a regional administrative body, issued 292 special permits in 2007, 207 in 2008, 245 in 2009 and about 100 between January and June 2010, at which time the Directorate General for Water and Forests suspended the special permit. However, the provincial authority felt that this permit met the needs of the numerous small-scale millers who were unable to apply for more expensive and/or larger-volume exploitation permits.

The **Autorisations de Sciage de Long** (Chainsaw Logging Authorisations) were officially suspended in 2005; nevertheless, nationwide, about 12 permits were issued in 2007 and 2008. This small-scale operating permit had the following characteristics:

- it granted maximum felling rights for 15 trees with an estimated volume of 75 m^3 sawnwood;
- it was valid for 3 months;
- it was issued by the Directorate General of Forests; and
- products made under the permit were authorised for sale throughout the country.

To meet their individual or collective requirements for sawnwood, village communities may exercise their **Droits d'Usage Coutumiers** (Customary User Rights) (Forestry Code, Art. 14). The members of village communities who, by tradition, live near an estate may exercise these rights in the rural forest estate freely and free of charge. The products obtained from the exercise of these rights are for non-commercial purposes only.

The **Forêts Communautaires** (Community Forests) permit provides a legal channel for communities to exploit and market timber but no regulation has yet been published to bring the corresponding provision of the Forestry Code into effect (Vermeulen and Doucet 2008).

The 2001 Forestry Code established the **Permis de Gré à Gré** (PGG). The PGG, combined with the Community Forest Permit, was supposed to replace all the earlier exploitation permits for small-scale and semi-industrial operations. It has the following characteristics:

- it grants maximum felling rights for 50 trees, without any specific management rules;
- it is awarded through an annual call for tenders;
- it is awarded to national operators by the Minister of Forests for an area demarcated by the government in the rural forest estate;
- products made under the permit are authorised for sale throughout the country; and
- a 6000 F CFA tax is levied for each tree.

The first call for applications took place in 2009. In Estuaire Province, 380 applications were filed with the forest services. Out of the province's authorised quota of 200 PGGs, 147 were ultimately issued for 12 months, starting October 2009.

Of the many legal guidelines for small-scale timber operations in Gabon, only a few are enforced or complied with in practice. The informal sector clearly plays an important role in the industry, both in small-scale chainsaw milling and in sales and processing. However, the contribution of small-scale chainsaw milling—both formal and informal—to the nation's forest policy and development has long been neglected. In our research, we attempt to evaluate its importance for the urban and rural economies in Estuaire Province.

3 Survey and analytical methods

Our research focused on sawnwood consumed in the Libreville urban area, regardless of origin; timber is considered to be of legal origin if covered by an exploitation permit or obtained as sawmill scrap; otherwise, it is considered to be of informal origin. We used 3 types of survey to study the flow and consumption of small-scale chainsaw milling products in Libreville and their importance to rural economies in Estuaire Province. First, the sale of small-scale chainsaw products was quantified based on a sample of sales points (hardware stores and outlets) in Libreville. Second, the main access points for sawnwood entering Libreville were traced in order to compare the volume of sawnwood entering the city with the volume sold in the city. Third, to analyse upstream activity, we surveyed a sample of rural chainsaw millers. All surveys were carried out continuously from July 2008 to December 2009.

3.1 Hardware stores and outlets

Although chainsaw milling products are sold in several cities in Gabon, our research concentrated on the Libreville area, where data were collected from July 2008 to December 2009. A preliminary survey of the timber outlets in early 2008 indicated the existence of about 210 outlets, most of which formed part of a hardware store. This estimate squared with the surveys carried out by the Ministry of Forestry in 2004 and 2007. Our pre-survey also generated basic information on the outlets, including the number of employees, the size of the sales points, the opening days and hours (thus indicating which days registered the highest sales), species sold and product types.

We encountered some difficulties in working with outlet managers, as did Diwassa (2007). Many were not easily convinced of the value of our surveys, leading to long discussions. We had to:

1. explain the purpose of the study;
2. obtain information on the organisational structure of the outlets; and
3. enlist the managers' cooperation.

This phase took several weeks because of the sensitivity of the subject. Guarantees were given that informers and sources of data collected would remain anonymous. Given the large number of markets and outlets, the budget and difficulties in finding outlet owners willing to be monitored over such a long period of time, we initially included 30 outlets in our monitoring exercise. In selecting outlets, we took care with their spatial distribution in Libreville to ensure maximum standardisation. Only 12 outlets were monitored regularly throughout the study period; the other 18 were monitored sporadically either in accordance with the managers' wishes or because the managers were not available. The data from these 18 outlets were analysed and compared with the data from the 12 outlets in the sample; the overall results were similar.

Our survey team spent 1 day a week in each of the outlets to collect the following information: name of outlet, date, seller code, number of employees

(full time and part time), salary estimates, type of products sold, timber species, size of products, source of products (village, city, division, region), stocks, daily deliveries, number of pieces of wood (by product type and species) sold on that day and sales price. The data covered only the survey day, which, to avoid overestimating sales, was not one of the busiest days of the week (often Monday and Saturday). To develop relationships with outlet managers, apart from a very few exceptions, the day and the data compilation team did not change during the data collection period.

Two hypotheses were used for estimating annual sales:

1. The data collection day was assumed to be representative of sales on the other days of the week and (2) the hardware store was assumed to be open 6 days a week, although certain outlets were open 7 days a week.
2. Annual sales were calculated by adding together the weekly sales from December 2008 to November 2009. The average annual outlet sales were then multiplied by the total number of outlets.

We compared volumes of informally sawn timber with the official timber production and sales figures by converting them into roundwood equivalents (RWE). Our survey team in Gabon did not specifically attempt to estimate the processing rate (PR) for chainsaw milling operations, but it would be reasonable to assume that the PR for Gabon was not very different from the one we estimated for Cameroon—an average 33.7% (Ondoua 2009)—given that the 2 countries use exactly the same operating methods.

3.2 Transit points

As observed during the preliminary survey, sawnwood products arrive in Libreville by land and by river. Land deliveries arrive along 1 of 3 roads: Cap Estérias, Route Nationale 1 or the road from Owendo. For timber transported by river, we found 4 landing zones, in the Alibadeng, Andong, Cap Caravane and Bambouchine districts.

All these transit points were monitored from August 2008 to December 2009, except for Bambouchine and Owendo, which were monitored from February and May 2009, respectively. For these 2 sites, we selected the lowest value observed in 2009 and retroactively extrapolated for the months not covered by the survey in order to produce a global estimate for the full period. Our extrapolation applied to less than 5% of the total estimated volume for 2008 and early 2009.

The survey team recorded the following data on vehicles transporting sawnwood through the transit points: time, type of vehicle, condition of load (one-quarter, one-half, three-quarters, full load, overloaded), products transported, species and, if possible, the quality of the sawnwood (sawmill scrap or chainsaw cuts). This information was entered into a standardised observation grid to facilitate future data entries.

The sawnwood transport capacity was estimated for each category of vehicle and then used to evaluate the volume transported. To err on the side of caution, we adopted the following conservative figures: an average volume of 4 m^3 of sawnwood per pick-up, 8 m^3 per 6-wheel truck, 12 m^3 per 8-wheel truck and 20 m^3 per 10-wheel and 12-wheel trucks. Our survey did not include vehicles transporting industrial-type sawnwood, that is, truckloads of 1 standard-size sawmill product. This applied especially to large trucks with more than 12 wheels.

Each transit point was systematically monitored for one or two 24-hour periods a week. The difference between nighttime deliveries (18:00 to 6:00) and daytime deliveries (6:00 to 18:00) varied from site to site. The data collected for each site were used to extrapolate the frequency of sawnwood deliveries each month, as shown in (Table 2).

3.3 Rural areas

Information collected in urban markets was used to identify zones in Estuaire Province that regularly supply considerable quantities to the outlets. Several informal chainsaw millers were

interviewed between July 2008 and November 2009 in various divisions of the province according to a semistructured interview grid that included questions on the sawyer's motivations, the targeted tree species, the use of the revenue earned from sawnwood, difficulties and potential solutions. Each chainsaw miller was asked to detail all the costs and profits from his latest chainsaw activities; 97 sawyers described 212 operations in about 30 informal chainsaw milling zones.

Apart from some rare exceptions (which were removed from the database), the sawyers' estimates matched, which indicated reliability in the information collected.

The data from chainsaw millers were processed using a database and a spreadsheet, but were not extrapolated. The large sample size should make the results genuinely representative of upstream chainsaw milling operations in Estuaire Province.

Table 2. Frequency of small-scale chainsaw product deliveries, per site

Site	Nighttime deliveries	Daytime deliveries
River landings	Every night	Every second day
Cap Estérias road	Every night	Never in daytime
Route Nationale 1	Every night	Every day
Owendo road	Every fourth night	25 days per month

4 Results

The main results presented are an estimate of the volumes of sawnwood from the informal sector sold in Libreville and a socio-economic analysis of upstream informal chainsaw milling operations in Estuaire Province.

4.1 Timber sales in Libreville

By extrapolating data collected from the outlets in the sample between December 2008 and November 2009, we estimated the annual average consumption of sawnwood in Libreville at 70 000 m^3, of which 27% comes from industrial sawmills, mainly as sawmill scrap. Therefore, the annual volume of products obtained directly from small-scale chainsaw millers is estimated at 51 100 m^3. This is the equivalent of about 17% of the volume of industrial sawnwood exported in 2008 (about 300 000 m^3), which is considerably less than that estimated by Gérard (2007).

The outlets in Libreville provided jobs for both expatriates and Gabonese. In our survey, we identified 397 permanent and semipermanent jobs in, and connected to, the Libreville outlets alone. By comparison, Mabiala (2004) set the figure at 221 direct permanent jobs, plus 571 direct jobs in carpentry, cabinet making and tapestry work in Libreville.

Our survey revealed that those working in the sector encounter multiple difficulties, as also described by Mabiala (2004) and Diwassa (2007): 'administrative hassles' (even for enterprises that are completely legal), difficulties in obtaining raw materials, difficulties in obtaining credit, scarcity of adequate equipment, undertrained labour force, insecurity, narrowness of local market due to low incomes, and limited access to large contracts for public works.

4.2 Variability in timber sales

The quantity of informally produced sawnwood sold in Libreville outlets varies greatly from month to month. The periodic variations in sales can be traced in part to seasonal differences, with the alternation of rainy and dry seasons affecting access to forestlands and the feasibility of felling operations (Figure 1).

Sales slumped for several months beginning in September 2008 (Figure 1), probably because of the international financial crisis, which affected the forestry sector. Unlike Cameroon, changes in the Gabonese small-scale chainsaw milling sector seem closely interlinked with changes in the industrial sector. The situation started improving as of March–April 2009 but the sector did return to its early 2008 levels.

4.3 Products, species and prices

Products used for construction (e.g. planks, formwork, beams) account for about 95% of sales. Planks alone account for nearly 40% of all chainsaw products.

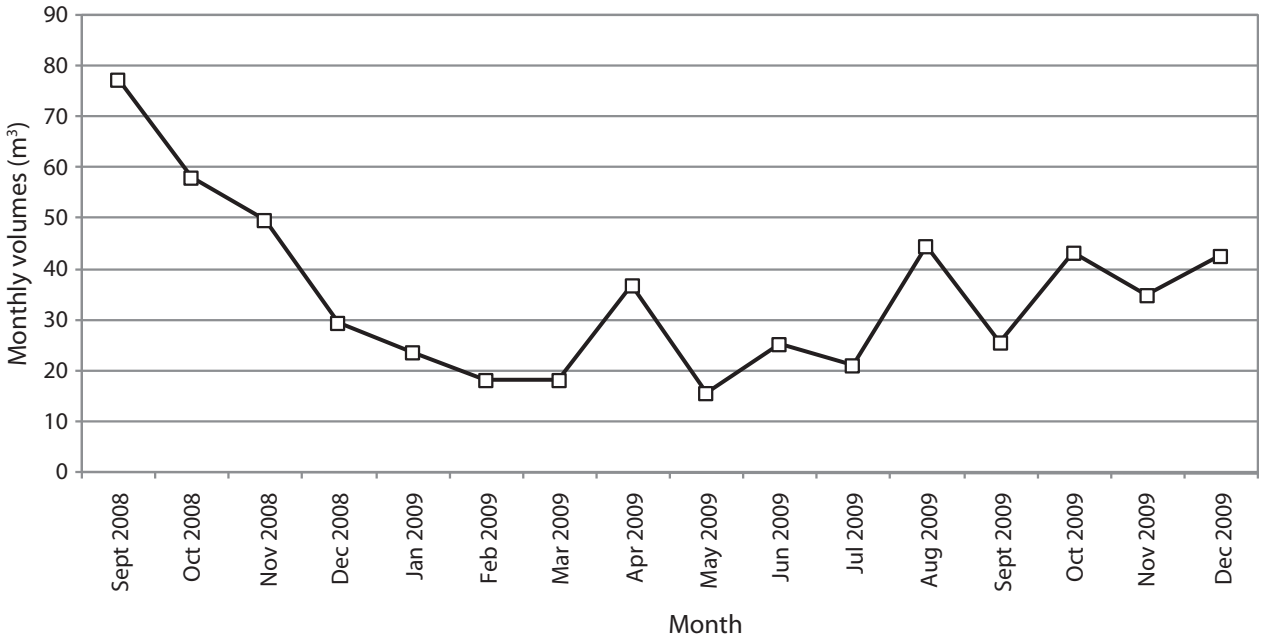

Figure 1. Average monthly sales for all outlets in the sample

Three species (okoumé, bilinga, izombé) comprise about 98% of total sales; okoumé accounts for about 92% of sales of products from the informal sector and about 98% of sales of products from the industrial sector.

The average price per cubic metre across all species and products, expressed in RWE, is about 58 000 F CFA, or 172 000 F CFA per cubic metre of sawnwood from the informal sector; note, however, that the sales price varies according to quality, type, product origin and type of timber. In general, cubic metre prices for okoumé sold on the local market are on average 15% lower than the free-on-board (FOB) prices for okoumé. This price difference is because of the better quality of products for the international market, which imposes higher quality standards and stricter specifications. However, because the price difference is slight, some industrial sawmills occasionally manage to sell their products on the local market.

4.4 Flow of chainsaw timber into Libreville

In total, an estimated 55 000 m^3 of chainsaw timber moved through the 7 main entry points into Libreville during the 5-month observation period in 2008. For 2009, the volume was about 70 300 m^3. As shown in Figure 2, Route Nationale 1 was the main road for transporting sawnwood to the capital (43% of total volume). The other 2 road entry points, Owendo (only sawmill scrap) and Cap Estérias (only sawnwood from the informal sector) together accounted for 13% of the total volume. Overall, 44% was transported by river—slightly more than that arriving via Route Nationale 1. Whereas trucks can start anywhere in the country, the pirogues used to transport chainsaw timber by river cannot travel over long distances; therefore, their loads have to come from the outlying areas of Libreville, and are almost always supplied by the informal sector. Most of the timber is landed at night and is transported by multiple routes before arriving at its destination. River transport is extremely important for sawnwood deliveries to Libreville because it is difficult for government services to effectively control the entry points (except, perhaps, at Bambouchine).

Some of the timber entering Libreville is sawmill scrap, including that arriving on the Owendo road, as well as probably a small part of the timber arriving on Route Nationale 1 from Kango and Ntoum, amongst others; however, the exact proportion of sawmill scrap cannot be determined, as we are unable to calculate reliably the volume of sawmill scrap transported on Route Nationale 1.

To estimate the volume of timber from small-scale chainsaw milling (that is, excluding sawmill scrap), we can begin by excluding deliveries on the Owendo road; this leaves a volume of 63 700 m^3 for 2009. Excluding also a rough guess of sawmill scrap arriving on Route Nationale 1, we could expect the total volume of sawnwood to fall below 60 000 m^3. This leaves a figure that is relatively close to the figure obtained from monitoring the outlets and hardware stores (55 000 m^3). The similarity of these 2 estimates, which were calculated using unrelated methods, supports the accuracy of our methods.

We can then calculate the amount supplied by the informal sector by subtracting from the estimated total amount of sawnwood (55 000 m3, excluding sawmill scrap) the volume authorised for production by small-scale chainsaw millers. In 2009, 147 PGGs (50 trees × 5 m3, or 250 m3 each) and 245 special permits (8 m3 each) were issued. The special permit is intended for small-scale chainsaw milling, whereas the PGG is intended, first and foremost, for semi-industrial production. We assume that half of the PGGs are used by small-scale chainsaw millers and the other half are used to produce logs for sawmills run by national operators. As the PGGs were not issued until October 2009, only 25% of the permit period, and presumably of the timber production, is in 2009. Based on these assumptions, we estimate the production from legal small-scale chainsaw milling in Estuaire Province in 2009 at 6 500 m3. By deduction, therefore, the annual volume of sawnwood from the informal sector entering Libreville should be at least 48 500 m3.

Data collected from monitoring the entry points attest to the sharp decline in the sector towards the end of 2008 (Figure 3), reflecting the trend observed in monitoring sales from outlets and hardware stores.

It is difficult to identify the exact factors that triggered this downturn and even more difficult to quantify the effects. The international economic crisis of 2008 and national political upheaval negatively affected Gabon's national economy in 2009. During 2009, the GDP growth rate remained positive (about 2%) but industrial production experienced a net recession. Other factors such as changes in construction technologies and stricter government controls could also explain the crisis in the chainsaw milling sector in Libreville in 2009, but their potential effects have not been assessed.

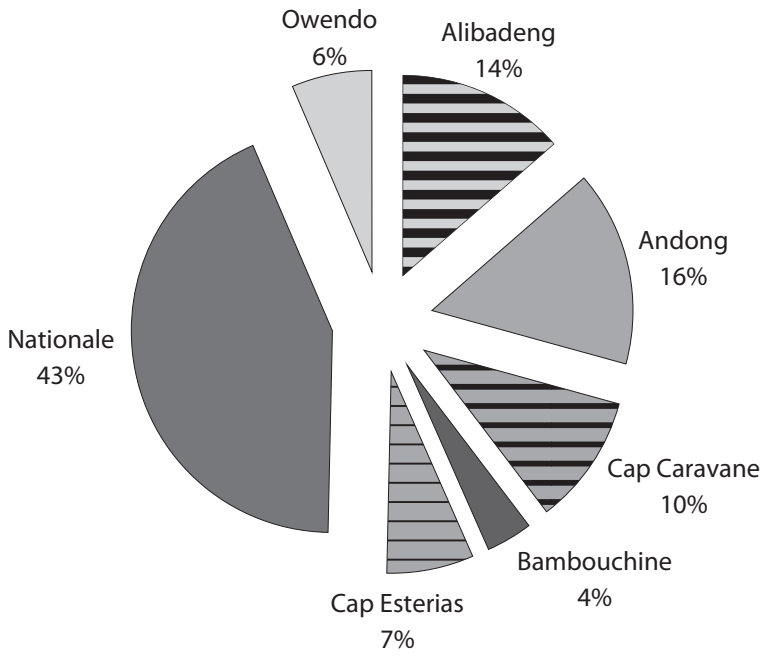

Figure 2. Proportions of sawnwood transported into Libreville for each entry point

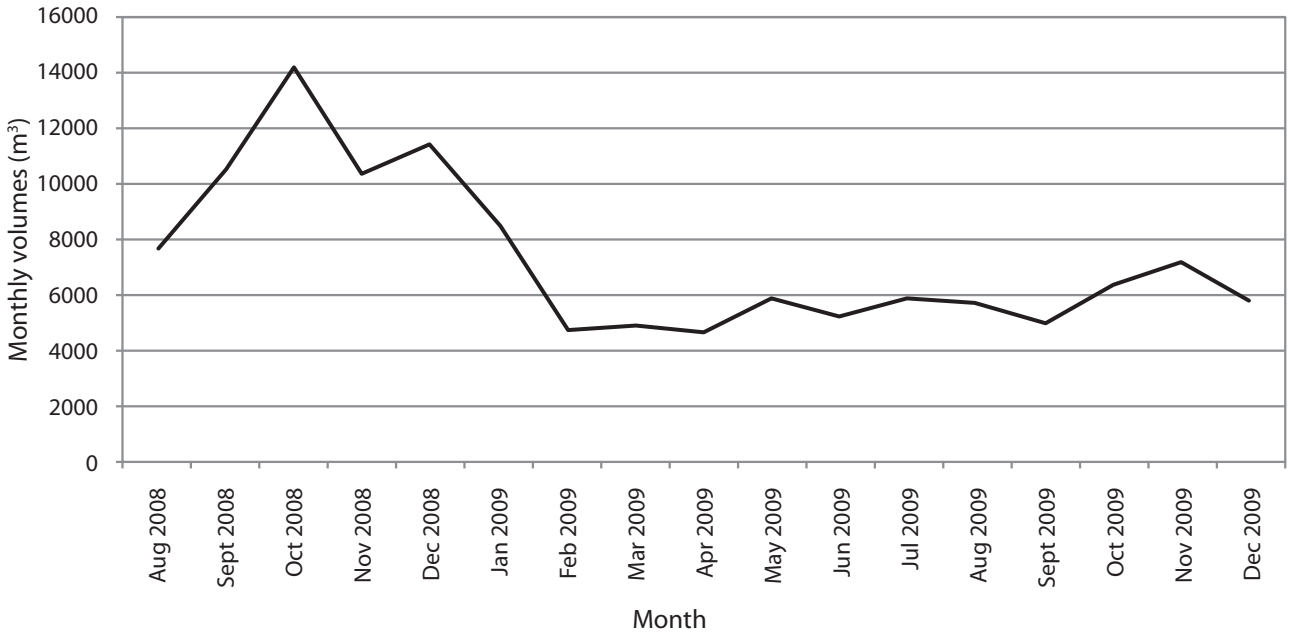

Figure 3. Estimated volumes of sawnwood entering Libreville each month

4.5 Small-scale milling operations in rural areas

4.5.1 Main characteristics of upstream operations

Small-scale chainsaw milling was introduced in Gabon in the mid-20th century mainly to meet local needs for timber for construction and furniture. In Estuaire Province, production developed towards the end of the 1990s, and more so in the early 2000s, to meet growing demand, especially from Libreville. The number of chainsaw millers entering the sector each year, based on our sample of 92 sawyers (Figure 4), indicates substantial growth in small-scale chainsaw milling production, mainly in the informal sector, during the past few years, probably to meet urban demand.

During the past 15 years, chainsaw milling has attracted young men who cannot find jobs in the

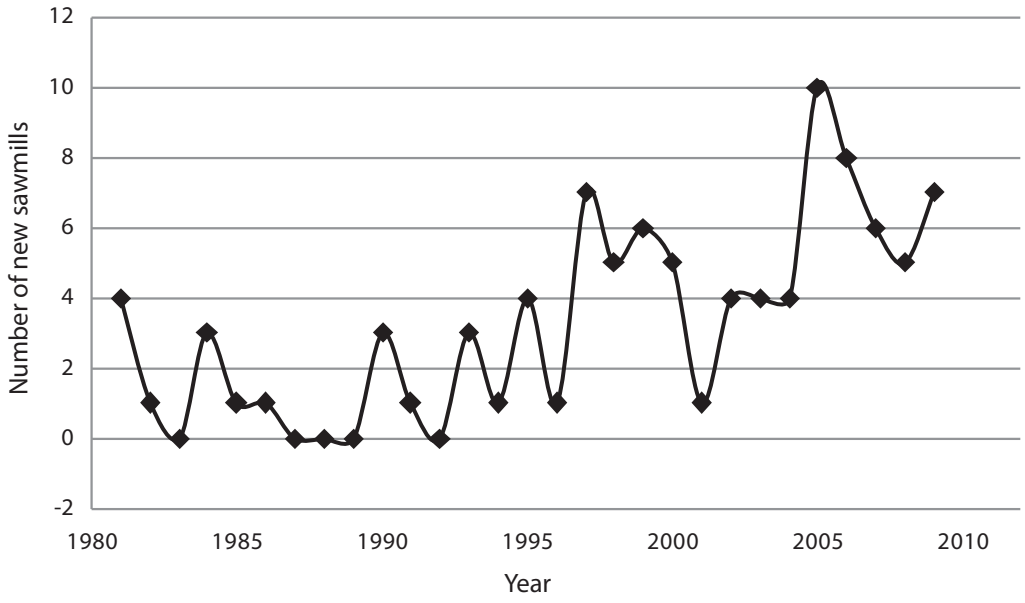

Figure 4. Number of chainsaw millers entering the informal sector each year (across whole sample)

cities or earn a decent living in rural areas. Most of the sawyers in our sample (58%) named the prospects of earning a good living as the main reason for entering the profession. According to survey responses, 80% use their income mainly for household expenses and 9% to buy land and/or build a house. For many rural households, revenue from chainsaw milling is important, as it provides a regular income that allows the families to meet their daily expenses or settle down.

Chainsaw milling, therefore, is seldom work that migrants and other populations with no socio-economic roots would choose by default. In our sample, 70% of the chainsaw millers were Gabonese nationals, 20% immigrants from Equatorial Guinea and 10% immigrants from Cameroon. As in Cameroon, becoming a chainsaw miller requires a relatively small investment—essentially the price of a chainsaw, often second hand. Sixty-four per cent of respondents in our survey owned at least 1 chainsaw. It is also quite easy to rent a chainsaw at a fixed daily price, as was done by about one-third of the sawyers in our survey. These chainsaw millers usually work less regularly than those who own their own equipment.

The small-scale chainsaw milling sector has developed largely without regard for the regulations. Of the 92 millers in the survey, 79% had never had a logging permit, either because the regulations are not well known and/or are not well adapted to small-scale operations or because the government lacks the means and interest to regulate this sector better. The sector's informality does not seem to have inhibited its growth in rural areas, and only 13% of the sawyers interviewed cited access to legal permits as a problem. Of much greater concern for chainsaw millers are the 'administrative hassles' they experience in their work, which increase their costs (discussed further below). The sawyers' second greatest worry is the high cost of chainsaw spare parts. Between easier access to a STIHL company representative, for instance, and easier access to legal timber production permits, these micro-entrepreneurs seldom hesitate to choose the former. Very few chainsaw millers perceived scarcity of forest resources as a problem (Table 3).

Table 3. Chainsaw millers' perceptions of problems encountered in their work

Main problems encountered	Response rate (%)
Administrative hassles	41
Equipment breakdowns	17
Difficulty in obtaining permits	13
Breach of trust (employer, client, worker)	10
Poor transport infrastructure	8
Difficult relationship with customary owners	5
Lack of capital	3
Scarcity of resource	2

As in industrial operations, okoumé was the most popular species, felled by small-scale chainsaw millers in 69% of the 212 timber production operations we monitored. The next most used species were dibétou (10%), bilinga (9%) and padouk (5%), which are mainly used for making chevrons, beams, planks and laths. In 63% of the chainsaw milling operations we monitored, the miller used the timber cuts to make a variety of products, probably to obtain as much revenue as possible from the felled tree. This method suggests that, as in Cameroon, the PR in chainsaw milling operations is probably equivalent to that in industrial production.

Another likely reason for the diversity of products is consumer demand. In 67% of the cases we monitored, the timber was bought locally by hardware dealers (Figure 5), who needed a relatively wide range of sawnwood products to satisfy a diverse urban demand. This applied less to other categories of buyers such as carpenters and entrepreneurs, who usually buy a small number of products that they need for specific purposes.

Most sawnwood ends up in urban areas, home to hardware dealers, carpenters, most entrepreneurs and private customers. However, long before its products reach the cities, the chainsaw milling sector constitutes the lifeline of a fully fledged local economy.

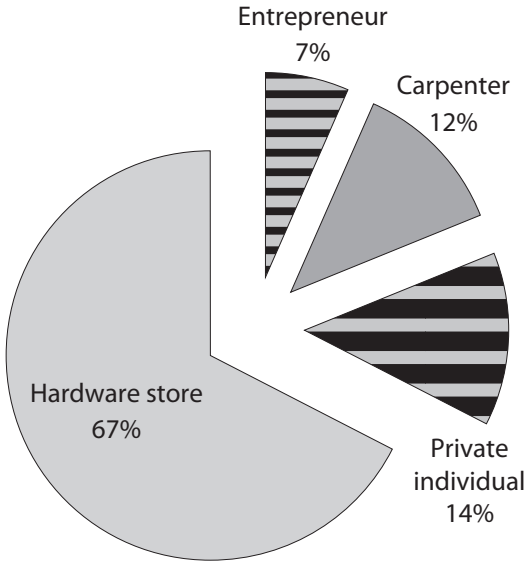

Figure 5 . Main customers for sawnwood products

4.5.2 Economic profitability

Through interviews with chainsaw millers, we learned that there are 2 processes for selling timber to urban customers. In most cases (58% in our sample), the customer places an order with the sawyer, in either the city or the countryside, for a precise quantity and quality of sawnwood. The sawyer then carries out the work in an area where he is certain to find the trees and where access costs and/or product removal costs are lowest. When working to order, sawyers from the city move to rural areas for short periods. On average, they exploit 3.2 trees for each order.

The other 42% of chainsaw millers interviewed work without any pre-orders. They fell trees, prepare the sawnwood and then look for buyers. Most of these chainsaw millers come from villages where they have direct access to forests and they fell 5 trees per operation (probably to make the most of the cost of transporting the products to the city and/or to generate bigger, more regular sales).

In the forest, there is no observable difference between how the chainsaw millers with different business models operate. The teams (1 chainsaw miller, 1 assistant, 2 or 3 carriers) and the equipment (often nothing more than a STIHL 070 chainsaw and a few axes and files) are the same. The two types also incur similar costs, of around 50 000 F CFA (about 25% lower than the corresponding costs estimated for Cameroon) (Figure 6).

The profits are also similar: 25 600 F CFA per cubic metre of sawnwood for chainsaw millers with orders and 22 500 F CFA for those selling on the open market. The small difference in profit between the 2 types occurs mainly because chainsaw millers working to order sell their product with a higher

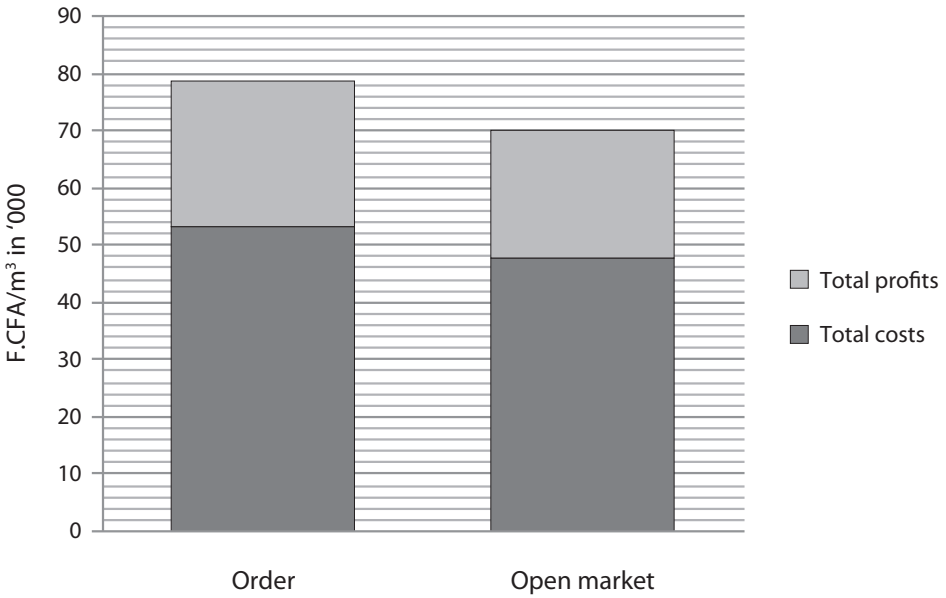

Figure 6. Profits and costs of chainsaw timber in the rural areas

price. Tree species is not a cause of the difference in sales prices, as both types of millers mostly sell okoumé. Rather, chainsaw millers working to order seem to negotiate better prices, probably because negotiations take place before the work begins. By contrast, when chainsaw millers selling on the open market arrive in the city, their load of sawnwood might not necessarily meet the demands of the day; in addition, as they are anxious to get paid quickly, they are in a weak negotiating position with their customers. Regardless of the supplier, urban traders mark up the retail price, more or less doubling the final price for sawnwood sold in Libreville and in Makokou (Boevinger 2008).

The added value from the small-scale chainsaw milling sector is important in the city. The raw material sells for about 75 000 F CFA per cubic metre, whereas the estimated average retail price is close to 172 000 F CFA. As traders have to cover other operating costs (e.g. wages, rent, taxes), their profit presumably amounts about 50 000 F CFA per cubic metre. This figure, multiplied by the total volume sold in Libreville (70 000 m^3 of sawnwood from both formal and informal sectors), amounts to about 3.5 billion F CFA in added value from the small-scale chainsaw milling sector every year. Chainsaw timber is also used in third-level processing, thus generating even more added value.

The small-scale chainsaw milling sector in Estuaire Province is also an important source of revenue for rural economies. The breakdown of chainsaw millers' costs (Figure 7) indicates that about 58% of their total operating costs are spent locally, mainly to pay workers' wages and to purchase trees from customary owners. For each operation, at least 5 or 6 individuals share these payments, which are injected directly into the rural economies and used mainly to cover daily expenses. This relatively recent source of income has become important for the many households that work directly in tree felling, processing and transporting or have 'their own trees' to sell to the chainsaw millers.

After the chainsaw miller's wage, the major cost item in chainsaw milling (about one-third) is transport of the timber from the felling site to the access trail and then to the market. This item is expected to rise in coming years. At present, okoumé and other wood species are readily available relatively close to Libreville, and felling sites are seldom more than 2 km from the access road. However, as these commercial species become scarcer, chainsaw millers will likely have to travel further from Libreville to reach a supply zone, with greater distances also between the felled trees and the access roads.

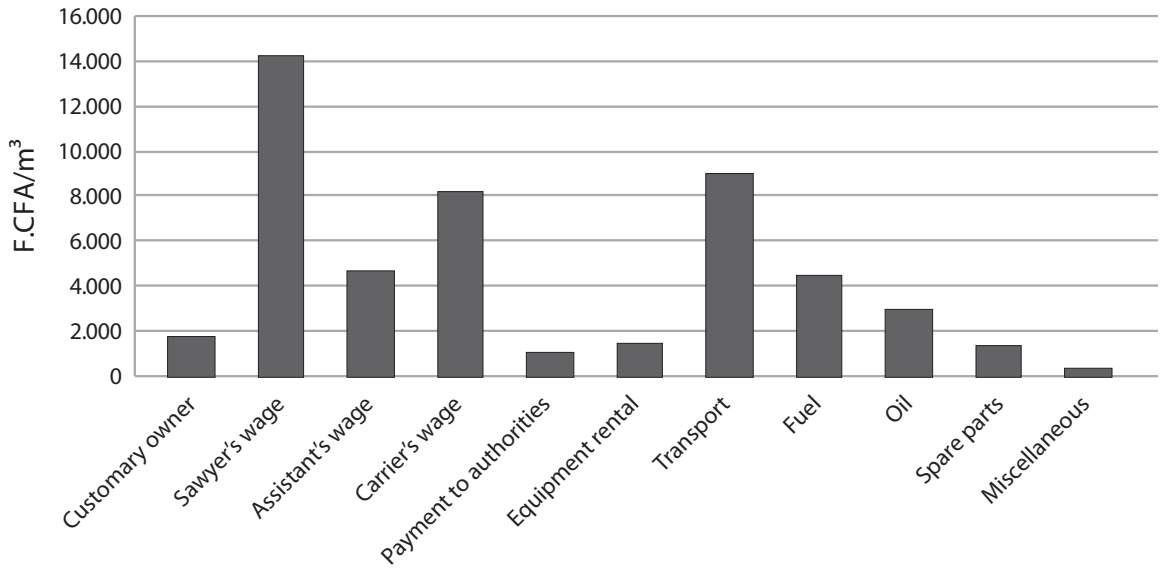

Figure 7. Breakdown of costs for small-scale chainsaw milling operations

The material operating costs (i.e. fuel and oils, spare parts, chainsaw rental/amortisation) account for only about 20% of the total cost (11 000 F CFA/m^3). The similarity between this amount and the 13 975 F CFA/m^3 cost estimate for the Makokou region (Boevinger 2008) or the 14 659 F CFA/m^3 cost estimate for Cameroon is understandable as operating methods are similar.

Payments to authorities (usually informal) for chainsaw milling rights—slightly more than 1000 F CFA/m^3—do not seem unreasonable. However, this cost is low probably because chainsaw millers or traders have to travel only a short distance to reach urban markets. By contrast, Boevinger (2008) notes a parafiscal tax of at least 135 000 F CFA for a truck carrying sawnwood to travel from Makokou to Libreville, equal to about 4500 F CFA/m^3.

Although these parafiscal taxes seem moderate when calculated per cubic metre, when applied to the total annual volume of small-scale chainsaw timber entering Libreville, they generate transactions worth about 50 million F CFA per year.

5 Discussion

5.1 Ecological impacts

The ecological impacts of small-scale chainsaw milling are difficult to quantify in the current, highly varied Gabonese context. The central role of the city–forest relationship in the sustainable management of natural resources has led to population densification in peri-urban forests, where operators are seeking to exploit timber resources as saleable sawnwood products; this trend will certainly continue in coming years. The timber cartels that are being created generally ignore the role of peri-urban forests, the norms of growth dynamics and the availability and management of woody resources, thus causing enormous environmental degradation.

In Estuaire Province, most chainsaw timber comes from areas outside of Libreville where commercial species are available and easy to access. Some trees are removed from farmlands and others from forestlands, usually less than 2 km from access roads. In either case, informal felling and timber production are carried out in rural forest estates where forest maintenance is not a priority. Legally speaking, therefore, chainsaw millers are not removing species under state protection as part of efforts to conserve Gabon's forests. Ecologically speaking, however, small-scale chainsaw milling operations contribute to forest degradation, whether inside a rural forest estate or not. Since small-scale chainsaw milling exploits a very small area compared with the total forest area, it currently poses little threat to the integrity of the ecosystem as a whole, except, perhaps, on the outskirts of certain cities. However, the country's long-term development will likely stimulate growth of the sector, affecting the quality of the forest ecosystems in ways that cannot yet be assessed.

It may be an option to set aside for small-scale chainsaw milling operations specific zones, near cities, that will have to be cleared some time in the future to make room for urban expansion or development projects (e.g. airports, industrial zones, plantations). Furthermore, small-scale chainsaw millers could be given access to the abandoned timber—usually unprofitable timber cuts—that logging companies leave on the ground in some forest operations, along forest trails and in log yards. An arrangement could be formalised through win–win contracts between rural communities and logging companies. These possible solutions would avoid waste and penalties whilst enabling the government to offer chainsaw millers a secure source of supply; in turn, chainsaw millers would be encouraged to legalise their activity and could participate in the implementation of national development programmes. In exchange for registering with the relevant government agency, chainsaw millers could be issued with a professional card that would give them legal access to timber abandoned in specific areas, both in Libreville and in the forest log yards where logs are left lying on the ground.

Another criticism of the chainsaw milling sector is its low PR. To our best knowledge, no study has yet been devoted to this issue in Gabon. In

Cameroon, our studies indicated that the PR for chainsaw milling was at least equal to that of of industrial sawmills. The PR in Gabon is unlikely to differ greatly from that in Cameroon, considering the similarities in operating methods of small-scale millers in the two countries; it is probably more than 30%, which is considerably higher than the 18–25% that Gérard (2007) hypothesized. Future research into this issue, preferably in diverse ecological and socio-economic conditions, would be worthwhile.

In the absence of the Community Forest Permit and after the suspension of the Special Permit, the PGG became the applicable permit for in small-scale chainsaw milling. However, Decree No. 725/PR/MEFEPA of 9 September 2008 setting out the conditions for issuing the permit stipulates that 'if the product is to be processed' a mobile saw should be used, rather than a chainsaw, which should be reserved for felling operations. This provision, designed to promote the semi-industrial sector, has not been adapted to the small-scale informal sector. Considering the capital and technical skills required for operating mobile saws, it is highly improbable that small-scale chainsaw millers will be able to comply with this decree in the short or medium term; indeed, it may be a major barrier to legalising the informal milling sector.

However, for those who do hold a PGG, excessive use of a mobile saw may be detrimental. The estimated daily PR for a mobile saw is 4 m^3 of sawnwood, which hardly seems compatible with the annual 50-tree maximum (= 250 m^3) authorised under the PGG. Therefore, for a mobile saw to be profitable, 2 or 3 PGGs would have to be combined—which places its use even further outside the financial reach of small-scale millers.

Furthermore, without a reliable, effective traceability system, the systematic use of mobile saws in PGG areas could encourage unscrupulous entrepreneurs to exploit lands outside the permit area in order to make the equipment more cost effective. Thus, although the obligation to use mobile saws was originally intended to improve the quality of logging operations, it may ultimately encourage illegal practices.

Finally, the higher quality of products processed using a mobile saw may in fact exceed the needs of the domestic market, especially if the better quality translates into higher prices.

As these arguments show, it is questionable whether mobile saws are needed to improve products from legal small-scale chainsaw milling. Research into the increased use of mobile saws would be worthwhile, in order to improve understanding of its probable impacts on resources and the sector. At this stage, there does not appear to be sufficient information to justify eliminating the chainsaw from small-scale timber production.

5.2 Domestic market for chainsaw milling products

By comparing the total volume of sawnwood consumed in Libreville with the number of people living in the region—about 1 million—we can estimate the per capita consumption of sawnwood from the informal sector, obtaining a figure of about 0.07 m^3 per year. This is similar to the corresponding assessment for Cameroon. Gabon's expected national development level and population growth rate should make it possible to maintain or even to increase this consumption level in the next few years. The national market for chainsaw timber is promising, despite its being lower in volume and price than the primarily export-oriented industrial sector. It is only to be expected, however, that large industries will take over the development of the sawnwood sector in Gabon, given the narrowness of the local market and the extent of forest resources. Therefore, the government's industrialisation strategy must do more than promote large-scale enterprises. The current domestic market supports an extensive network of small and medium-sized enterprises (SMEs) and industries (SMIs), most of which are informal and often unstable. However, the facts that they supply urban consumers with affordable sawnwood and create at least 1000 direct jobs in Libreville alone demonstrate their economic legitimacy. The SMEs and SMIs have to cope not only with the same problems faced by small semi-industrial operators, such as weak financial capacity and shortage of well-trained workers (Nze Nguema

2007). They also have to cope with problems that are specific to the informality of their sector: uncertainty of trade relations, the burden and variability of 'hassles' and severe price competition. These conditions encourage small-scale operators to reduce risks inherent in their trade rather than to make productive investments that would trigger growth and development.

The industrialisation of Gabon's timber sector would benefit from closer relations between the formal sector and the informal chainsaw milling sector, such as through partnerships between operations managers and small-scale wood processors (Mabiala 2004). This would stabilise the informal sector and help provide it with a legal framework. The PGGs also provide an opportunity to strengthen ties between the industrial sector and the small-scale chainsaw milling sector through financial, technical and commercial support (Lescuyer *et al.* 2010).

5.3 Permits for small-scale chainsaw milling

Regulations for "small permits" also changed significantly during the past few years. The *Autorisation de Sciage de Long* (Chainsaw Logging Authorisation) and the Special Permit were phased out and replaced by the PGG. This change was welcome for 2 reasons. First, given Gabon's negotiations with the European Union as part of the FLEGT process, it was imperative that application of the forest law be clarified and logging permits be made to comply with the Forestry Code. Second, for quite some time, both the Special Permit and the *Autorisation de Sciage de Long* were used to support illegal practices, in particular by operations that largely exceeded the quotas allowed under these very limited permits (Boevinger 2008).

The first batch of PGGs, which have now replaced the small permits, were issued in October 2009. The large number of applications for a PGG seems to indicate, on the one hand, that even small-scale forest entrepreneurs can follow application procedures and, on the other, that the permits meet their expectations, at least in part. In Estuaire Province, for instance, the number of PGG applications was double the province's allocated quota, indicating widespread awareness of the process amongst operators.

However, the first PGG campaign had 2 major drawbacks. First, many PGG recipients (more than 25% in Estuaire Province) were unable to pay the 300 000 F CFA felling tax, which corresponds to 6000 F CFA per tree and is a major obstacle for many small-scale chainsaw millers. The second drawback was that the number of PGGs issued seemed incommensurate with the size of the informal sector. These permits cover, at best, two-thirds of urban consumption in the Libreville areas, based on the optimistic assumptions that all the timber from the felling operations was used to supply the domestic sawnwood market and that 2009 was a normal consumption year.

The PGG alone is probably insufficient to control most informal chainsaw milling operations. To improve its effectiveness, the first step should be to monitor and analyse its impact on chainsaw milling. Additional measures will probably be needed, such as the Community Forest Permit, which grants village operators legal access to the woody plants in forest communities. A recent pilot experiment has been very instructive (Vermeulen and Doucet 2008), but the regulations that would bring Community Forest Permits into effect in Gabon have not been published. The absence of these permits—which, together with the PGGs, were supposed to replace the Family Felling Permits (Coupe Familiale)—effectively legitimises illegal practices in the eyes of the local population.

5.4 Economic incentives

Consumers in Libreville purchase sawnwood from the informal sector because the price is competitive. The informal sector can supply large volumes of sawnwood at prices below those charged by the industrial and semi-industrial sectors. Despite the low prices, small-scale operators earn a respectable profit from their profession. It is therefore highly unlikely that the chainsaw millers in the informal sector would be convinced to adopt legal methods if the related costs would seriously eat into their earnings. Measures to implement regulations should therefore be based on economic incentives designed to reduce the cost of 'going legal'.

A major obstacle in developing the small-scale and semi-industrial sectors is the difficulty in obtaining credit (Diwassa 2007, Nze Nguema 2007). This barrier prevents operators from making productive investments and reduces small-scale chainsaw millers' capacity to obtain official permits, as seen with the PGGs. Reallocating part of the funds earmarked for industrialising the timber sector in Gabon to supporting small and very small national entrepreneurs could prove effective.

Small entrepreneurs could be further supported by adjustments to the forest fiscal regime, at least during the transition phase. The Forestry Code provides for a fixed tax, to be paid in advance, for chainsaw felling and processing (Art. 244). Operators would no doubt find a phased fiscal system more attractive.

Last, facilitating competition for public contracts for small-scale chainsaw millers who engage in first-, second- and third-level processing would undoubtedly provide them with a strong incentive to legalise their activities. This would require revising current regulations, which are too cumbersome for small-scale entrepreneurs, and changing administrative practices that tend to grant privileges to certain economic operators rather than judge proposals solely on their competitiveness (Diwassa 2007).

6 Conclusion

During the latest two years, Gabon has experienced many changes that will probably have a powerful impact on the domestic sawnwood market: return to political stability, emergence from the international financial crisis period, a ban on unprocessed log exports, introduction of a support fund for the industrialisation of the timber industry, commitment to the FLEGT process and creation of PGGs. This mix of factors is likely to promote across-the-board growth in the timber sector in the next few years, either by maintaining and developing exports or by meeting domestic demand stimulated by the country's economic growth. It is difficult to imagine how these changes will affect the evolution of the domestic market for chainsaw milling products. Such changes may entail, for instance, greater involvement of the industrial sector especially through lower-quality products, increased use of sawmill scrap, greater availability of sawnwood due to PGGs or Community Forest Permits, or a large informal sector that continues to be capable of adapting rapidly to changes in local demand. The 2-year survey (2008–2009) in Libreville and Estuaire Province provides a detailed picture of this sector before these further changes occur. A repeat survey in coming months or years would provide the information needed for a diachronic analysis of this sector and would allow for better understanding of the recent dynamics of change and the effectiveness of the forest policy in relation to these issues.

Gabon's domestic market for chainsaw timber has been seriously under-valued—or even ignored—by most political and economic decision-makers. This market has stimulated a vibrant economic sector, although largely informal, that generates revenue and creates jobs in both urban and rural areas. In a country with such vast forestlands as Gabon, this sector is a lever of development for thousands of operators who do not necessarily have the means to exploit the forests according to the dominant forest management model applied to large forest concessions. Other sustainable management modes for forest resources need to be considered, designed and applied. Such modes should be especially tailored to fit the needs of the micro-entrepreneurs with limited technical, human and financial resources. Provisions in the Forestry Code that promote this type of activity need to be completed or further adapted. A more complete understanding of the whole sector, from the small-scale chainsaw miller to the urban consumer, would facilitate the introduction of tools better able to stimulate the development of chainsaw milling in Gabon.

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For the past 10 years, Gabon's forest policy has sought to ensure sustainable forest management by favouring the development of large forest concessions. Operating alongside industrial companies, however, is a small-scale chainsaw milling sector that mainly serves the domestic market. Based on sales figures for a sample of outlets and for chainsaw products entering Libreville, monitored between July 2008 and December 2009, the country's annual consumption of sawnwood is estimated at about 70 000 m^3, of which at least 50 000 m^3 is produced in the informal sector. Products from informal chainsaw milling operations were estimated to account for less than 20% of the sawnwood exported from Gabon in 2008. In 2009, the country's urban consumption of sawnwood fell dramatically, probably because of a serious national economic crisis. Nonetheless, in each of those years, chainsaw milling sales created at least 1000 direct, permanent and semi-permanent jobs in Libreville and generated at least 3.5 billion F CFA in added value. Informal chainsaw milling is also highly profitable upstream in the sector. During the study period, the average profits were close to 25 000 F CFA/m^3 for the sawyers, with their operating costs estimated at 50 000 F CFA/m^3. This sector has a major impact on rural economies, as 58% of the total operating costs are spent locally. The possible options for regulating and formalising the small-scale chainsaw milling sector include combining restrictions on ecological impact with revisions of regulations and the introduction of economic incentives.

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